Calculators and the Inverse Circular Functions

In the sections to come, we will have need to approximate values of the inverse circular functions. On most calculators, only the arcsine, arccosine and arctangent functions are available and they are usually labeled as $\sin^{-1}$, $\cos^{-1}$ and $\tan^{-1}$, respectively. If we are asked for an arccotangent, arcsecant or arccosecant, we often need to employ some ingenuity, as the next example illustrates.

Using a Calculator to Find Values

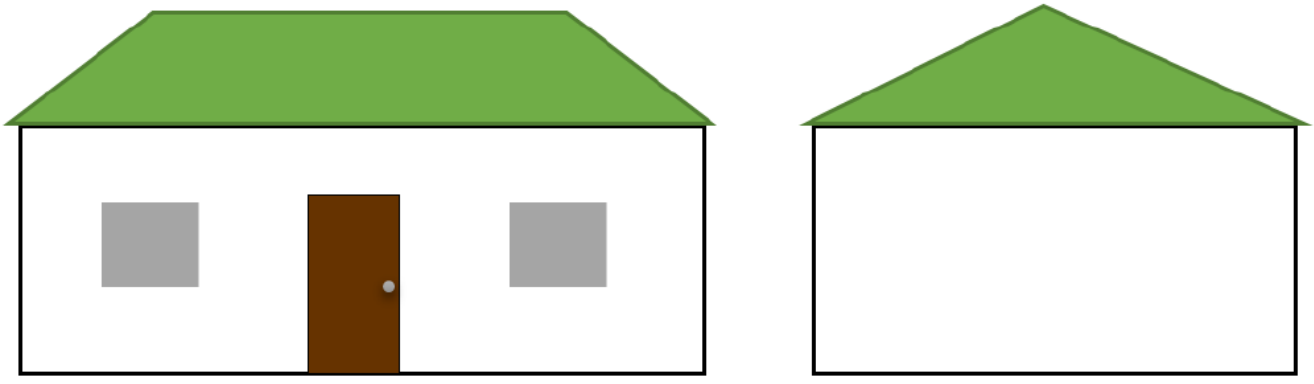
Example 5.4.1. Use a calculator to approximate the following values to four decimal places.

1. $arc\cot(2)$
2. $\sec^{-1}(5)$
3. $\cot^{-1}(-2)$
4. $arc\csc\left(-\frac{3}{2}\right)$

Applications of Inverse Trigonometric Functions

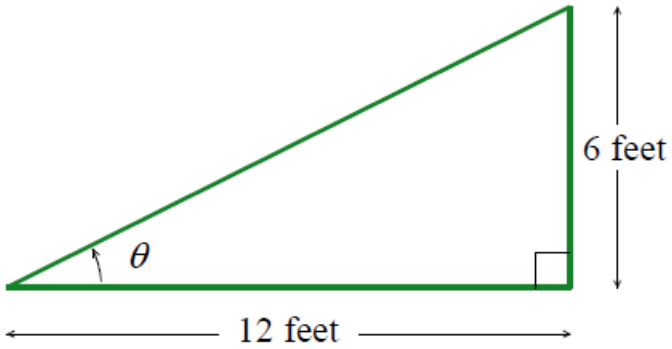
The inverse trigonometric functions are typically found in applications where the measure of an angle is required. One such scenario is presented in the following example.

Example 5.4.3.[1] The roof on the house below has a 6/12 pitch. This means that when viewed from the side, the roof line has a rise of 6 feet over a run of 12 feet. Find the angle of inclination from the bottom of the roof to the top of the roof. Express your answer in decimal degrees, rounded to the nearest hundredth of a degree.



Front View Side View

Solution. If we divide the side view of the house down the middle, we find that the roof line forms the hypotenuse of a right triangle with legs of length 6 feet and 12 feet. Using trigonometric functions of right triangles, we find the angle of inclination, labeled θ below, satisfies $\tan\theta = \frac{6}{12} = \frac{1}{2}$.



Since θ is an acute angle, we can use the arctangent function and we find (using a calculator in degree mode)

$$\theta = \tan^{-1}\left(\frac{1}{2}\right) \approx 26.57°$$